Cs-Activated C\textsubscript{58} \rightarrow C\textsubscript{60} Conversion in Fullerides

S. Ulas, D. Löffler, P. Weis, A. Böttcher, M.M. Kappes

Institut für Physikalische Chemie, Karlsruher Institut für Technologie, Karlsruhe, 76131, Germany
seyithan.ulas@kit.edu.

Thin monodisperse cluster materials consisting of non-IPR C\textsubscript{58} fullerene cages have been deposited onto HOPG by soft-landing of mass-selected C\textsuperscript{+}\textsubscript{58} ions. The ions have been created by electron-impact induced fragmentation/ionization of IPR C\textsubscript{60} cages [1]. In analogy to IPR fullerenes [2] the doping of the C\textsubscript{58} films by alkali metals (e.g. Cs) leads to the formation of alkali-metal-based fullerides, Cs\textsubscript{x}C\textsubscript{58}. The temperature resolved mass spectra, TRMS, taken during the sublimation of Cs\textsubscript{x}C\textsubscript{58} phase reveal three well distinguishable components, C\textsubscript{56}, C\textsubscript{58} and C\textsubscript{60}. The new components, C\textsubscript{56} and C\textsubscript{58}, indicate the transfer of a C\textsubscript{2} unit from one C\textsubscript{58} cage to an adjacent one, -[C\textsubscript{58}]-[C\textsubscript{58}]- \rightarrow C\textsubscript{56} + C\textsubscript{60} to be a process which can compete with the breakage of the intercage bonds constituted by non-IPR sites (e.g. 2AP-2AP). The doping Cs atoms located in vicinity of the intercage bonds weakens them significantly and consequently facilitates the high-temperature C\textsubscript{2} transfer and the formation of C\textsubscript{60} species. The Cs doping raises the C\textsubscript{58} \rightarrow C\textsubscript{60} conversion ratio from 0.04 for pristine C\textsubscript{58} films up to ~3.9 for a saturated Cs\textsubscript{x}C\textsubscript{58} phase. Consequently, sublimation of the saturated Cs\textsubscript{x}C\textsubscript{58} fullerides proceeds predominantly via C\textsubscript{60} emission and demonstrates the crucial role of Cs atoms as catalysts for the bond-breaking followed by C\textsubscript{2} inclusion.

Figure 1: Sublimation map, TRMS, obtained for a layered Cs\textsubscript{x}C\textsubscript{58} cluster material.

REFERENCES